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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/081,818	02/20/2002	Jerome M. Eldridge	1303.045US11	3148

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EXAMINER

HO, TU TU V

ART UNIT	PAPER NUMBER
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2818

DATE MAILED: 01/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/081,818

Applicant(s)

ELDRIDGE ET AL.

Examiner

Tu-Tu Ho

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 October 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-84 is/are pending in the application.
- 4a) Of the above claim(s) 24-84 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/ Restriction

1. Applicant's election without traverse of claims 1-23 and cancellation of claims 24-84 in Paper No. 3 filed 21 October 2002 is acknowledged.

Specification

2. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections/ Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter that the applicant regards as his invention.

3. Claims 14-17 and 23 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

- Claim 14 recites "The vertical non volatile memory cell" which lacks an antecedent basis. As best as can be understood, claim 14 is dependent on claim 10.
- Claim 15 recites "The vertical floating gate" which lacks an antecedent basis. As best as can be understood, claim 15 is dependent on claim 14.

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- Claim 16 recites “The vertical non volatile memory cell” which lacks an antecedent basis. As best as can be understood, claim 16 is dependent on claim 10.
- Claim 17 recites “The vertical non volatile memory cell” and “the horizontally oriented floating gate” which lack an antecedent basis. As best as can be understood, claim 17 is dependent on claim 16.
- Claim 23 is not proper because it does not refer back to all limitations of a previous claim. See MPEP § 608.01(n). As best as can be understood, claim 23 is dependent on claim 18 (assuming that a device having a first and second source/drain regions and a floating gate is a floating gate transistor).

4. Claims 2 and 10 are objected to because of the following informalities/typographical errors:

- These claims recite:
“wherein the aluminum oxide has a number of small compositional ranges such that gradients which produce different barrier heights at an interface with the floating gate and control gate” which appears to be incomplete. Perhaps the phrase should be:
“wherein the aluminum oxide has a number of small compositional ranges such that gradients can be formed by an applied electric field which produce different barrier heights at an interface with the floating gate and control gate”.

5. Claims 8 and 13 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim, Applicant is required to

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cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Specifically, these claims recite: "the low tunnel barrier intergate insulator" instead of "the asymmetrical low tunnel barrier intergate insulator" thus failing to further limit the subject matter.

Normally, these problems are not critical; however, in the instant case, as applicants are aware, there is a co-pending application (SN 09/945507) having 80 claims that are essentially similar to the claims of the present invention if one were to disregard the limitation "asymmetrical".

Appropriate correction is required.

Double Patenting

6. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

7. Claims 1-23 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1-23 of copending Application No. 09/943,134 and over claim 1-22 of copending Application No. 10/028,001.

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Although the conflicting claims are not identical, they are not patentably distinct from each other.

Referring to claims 1, 10, and 18, claims 1, 10, and 18 of Application No. 09/943,134 and claims 1, 9, and 17 of Application No. 10/028,001 recite a semiconductor memory device as claimed but fail to disclose that the asymmetrical low tunnel barrier intergate insulator (ALTBII) is formed by atomic layer deposition (ALD). However, not only that ALD is known in the art for forming gate dielectric layers (see, for example, U.S. Patent Application Publication 2002/0137250 by Nguyen et al., paragraphs [0037], [0039], and [0041]), a process, just as ALD, when claimed in a device claim is deemed non-limitation. In re Brown, 173 USPQ 685 (CCPA 1972). Also, a product by process claim directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 1 S at 17 (footnote 3). See In re Fessman, 180 USPQ 324, 326 (CCPA 1974); In re Marosi et al., 218 USPQ 289, 292 (Fed. Cir. 1983); and particularly In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product "gleaned" from the process steps, which must be determined in a "product by process" claim, and not the patentability of the process. See also MPEP 2113. Moreover, an old and obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1-23 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Lee et al. U.S. Patent Application Publication 2002/0106536 (Publication '536).

The figures and reference numbers referred to in this office action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Referring to these claims, Lee et al. disclose in Figures 1-7, particularly Figure 1B, and respective portions of the specification a high-k dielectric layer comprising alternate layers of

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ZrO₂ and aluminum oxide (Al₂O₃) above a metal silicate interface layer whose combination structure is layered between a floating gate and a control gate. Specifically, Lee et al. disclose a floating gate transistor, comprising:

- a first source/drain region and a second source/drain region separated by a channel region in a substrate;

- a floating gate opposing the channel region and separated therefrom by a gate oxide;

- a control gate opposing the floating gate; and

- wherein the control gate is separated from the floating gate by an asymmetrical low tunnel barrier intergate insulator 18 or 20 formed by multiple atomic layer deposition (Lee's claim 44, claim 11, and paragraph [0058]).

Although Publication '536 does not label the insulation layer 18 or 20 being "an asymmetrical low tunnel barrier intergate insulator" (ALTBII) as claimed by Applicant, Lee's structure does not distinguish from the claimed structure. Further, the labels nonetheless are meaningless. The teachings of Publication '536 anticipate Applicant's claimed structure regardless of whether the layer is labeled ALTBI. See *In re Pearson*, 181 USPQ 642; *Ex parte Minks* 169 USPQ 120; or *In re Swinehart* 169 USPQ 226, all of which make it clear that mere "labels" or "statements of intended use" as we have here in ALTBI do not distinguish over Publication '536's structure which may be likewise labeled.

The same remark is made for the aluminum oxide 18/20. Although Lee does not claim the aluminum oxide asymmetrical low tunnel barrier intergate insulator as having a number of small compositional ranges such that gradients can be formed in an applied electric field which

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produce different barrier heights at an interface with the floating gate and control gate, Lee's aluminum oxide nevertheless anticipates the claimed layer aluminum oxide. It would be extremely hard to prove that Lee's aluminum oxide does not anticipate the claimed layer aluminum oxide.

Regarding claims 7, 8, 12, and 13, Lee et al. disclose further that the floating gate includes a polysilicon floating gate having a metal layer 18 formed thereon in contact with the asymmetrical low tunnel barrier intergate insulator 20, and that the control gate includes a polysilicon control gate having a metal layer 18/20 (Figure 1C) formed thereon in contact with the low tunnel barrier intergate insulator 20, wherein the metal layer 18/20 includes a metal layer that has a different work function than the metal layer 18 formed on the floating gate (with respect to this feature, it would be easier to prove that Lee's metal layer 18/20 has a different work function as compared to Lee's metal layer 18 than it is to prove that Applicant's metal layer 216 has a different work function as compared to layer 217, the compositions of which (for layers 216 and 217) are not disclosed anywhere in the specification).

9. Claims 1-23 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Nguyen et al. U.S. Patent Application Publication 2002/0137250 (Publication '250).

Nguyen et al. disclose a high-k dielectric layer comprising lanthanum, aluminum, nitrogen, and oxygen (NLA as being termed, paragraph [0032]) (Abstract) for use as an insulator between a floating gate and a control gate (paragraph [0036] and Figure 6), wherein the dielectric

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layer is graded (hence, asymmetrical) (Abstract) and can be formed by ALD (Abstract, paragraphs [0037], [0039], and [0041]). It would appear that Nguyen's NLA layer, comprising aluminum and oxygen and being graded, could function as the claimed aluminum oxide asymmetrical low tunnel barrier intergate insulator, although the "statements of intended use" (asymmetrical low tunnel barrier intergate insulator) is not exactly termed.

10. Claims 1-6, 9-11, and 14-17 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Lee et al. U.S. Patent 5,923,056 (patent '056).

Patent '056 disclosed a doped, metal oxide dielectric layer, wherein the metal oxide is a Group III or Group VB metal oxide (e.g. Al.sub.2 O.sub.3, Y.sub.2 O.sub.3, Ta.sub.2 O.sub.5 or V.sub.2 O.sub.5) and the metal dopant is a Group IV material (Zr, Si, Ti, and Hf) (Abstract), formed by ALD (column 2, lines 15-23), to be used as intergate dielectric material. Just as detailed in paragraphs 8 and 9 above, it would appear that patent '056's doped aluminum oxide intergate insulator layer could function as the claimed aluminum oxide asymmetrical low tunnel barrier intergate insulator.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (703) 305-0086. The examiner can normally be reached on 6:30 am - 5:00 pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (703) 308-4910. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782.

TH

Tu-Tu Ho
December 30, 2002

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